

VOLCA

*Some volcanoes are so huge they
can change the world's climate ...
and more.*



A mysterious blue fog settles on Paris.
Icebergs form in the Gulf of Mexico.
In England, crops die in the field.

The year was 1783, and for weeks, the ground under an old volcano called Laki, located in a remote region of Iceland, rumbled and quaked. Finally, on June 8, the earth split open to let loose an explosion of gas, ash, and rock. Over the next eight months, 22 volcanoes erupted along a crack, or fissure, more than 15 miles long. Lava flowed like water out of the vents, piling up nearly 600 feet deep in places. Fifty million tons of sulfur dioxide, a poisonous gas from deep inside the earth, shot into the atmosphere, where winds carried it for hundreds of miles. Laki devastated the small country of Iceland, killing most of the cattle, horses, and sheep with its deadly gases. Acid rain shriveled and ruined the crops. Lava

ANNOES

Rock the World

by Meg Moss

buried villages, and more than 9,000 people died from starvation.

Meanwhile, in Paris, France, which lies about 1,500 miles to the southeast of Laki, it's springtime. But spring isn't the only thing in the air. A strange, dry, blue fog has settled over the city. People find it difficult to breathe. The sunlight is oddly dull, and as summer passes into winter, snow and ice pile up.

I can hardly read in this strange, blue fog.



Benjamin Franklin lives in France as the American ambassador. A keen and curious observer, he wonders about the bizarre weather. Could it be caused by meteors entering the earth's atmosphere? Or perhaps by volcanoes in Iceland, whose "smoke might be spread by various winds, over the northern part of the world"? Bingo. Franklin was the first to understand that the effects of a gigantic volcano could be felt far, far away.

Kaboom! Asleep for 123 years, Mount St. Helens in the state of Washington awoke in a bad mood in 1980. It was a mere hiccup, however, compared to the world's largest volcanoes.



Today the crack where Laki erupted more than 200 years ago looks like a long, green scar in the earth.

How Big Is Humongous?

Volcanoes come in many sizes. To describe volcanoes, scientists use words such as *gentle*, *explosive*, *large*, *severe*, *colossal*, *supercolossal*, and—no kidding—*humongous*. This scale is based on a volcano's explosivity, that is, how much ash, rock, and gas it hurls out and how high the eruption cloud, or plume, jets into the air.

If a plume reaches nine or ten miles high, it enters the stratosphere, a layer of our atmosphere that lies high above earth's restless weather. Once in the stratosphere, the volcano's sulfur dioxide gas combines with water to create tiny droplets called aerosols. These aerosols reflect the sun's energy, keeping its light and heat from reaching the earth. Currents in the stratosphere can spread these aerosols around the globe for years.

Of the earth's 539 live volcanoes, as many as 20 may be erupting each day, but most are pretty weak. Laki, with its nine-mile plume and four trillion gallons of lava, was a "large" volcano. Big, yes, but volcanologists (scientists who study volcanoes) believe that the world's largest volcano, Toba, erupted about 74,000 years ago. It is the only one to earn the title "humongous."

Volcanoes that Rocked the World

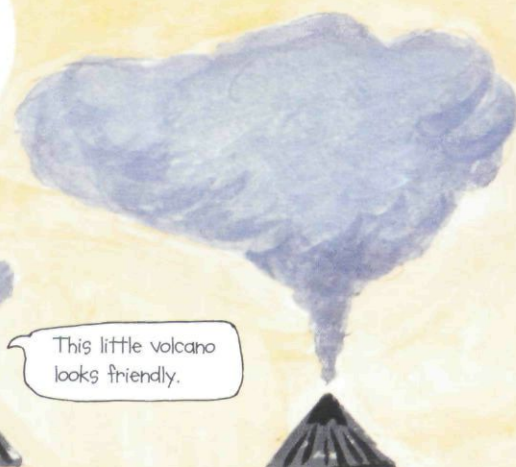
Here's how some of the world's largest volcanic eruptions stack up. The humongous prehistoric explosion at Toba dwarfs them all.



Pinatubo
Philippines, 1991



Mount St. Helens
United States, 1980



Krakatau
Indonesia, 1883

This little volcano looks friendly.

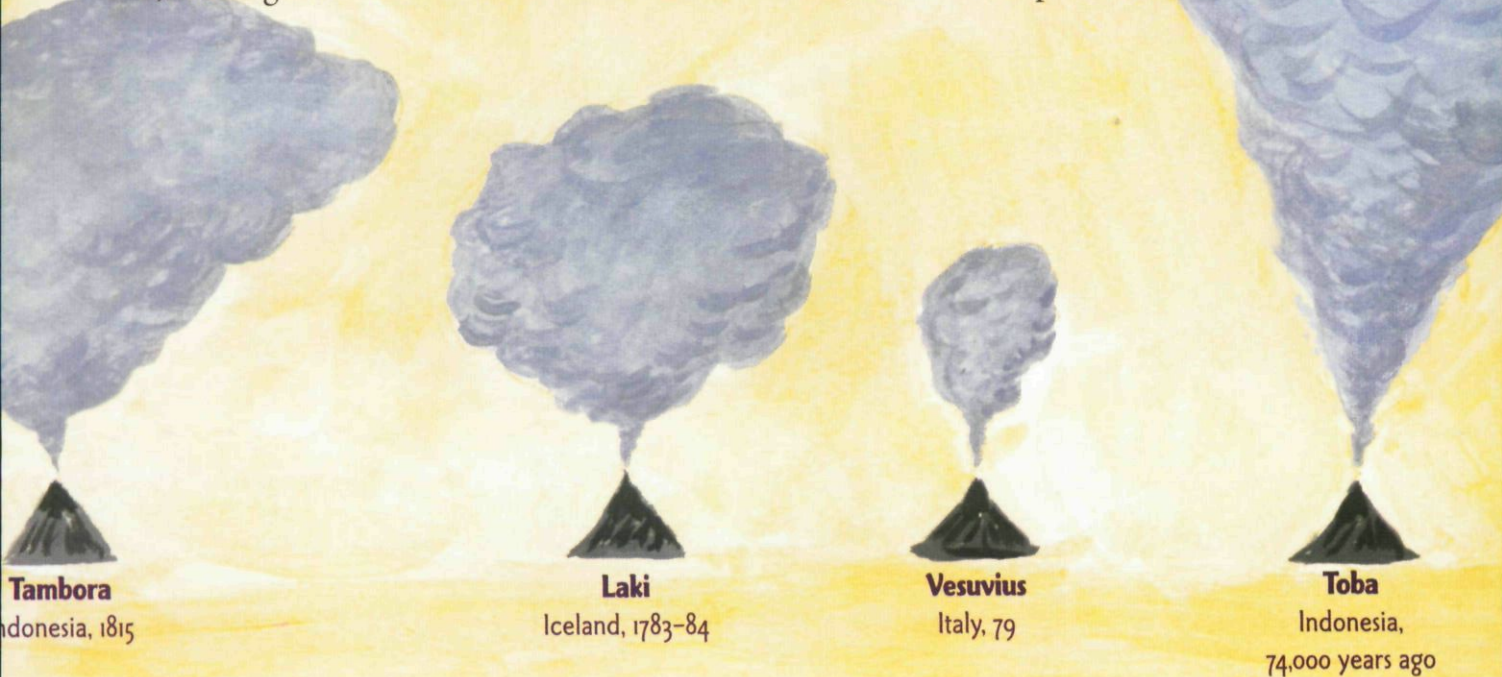
The ancient Toba volcano blasted out a 1,000-square-mile hole on the Indonesian island of Sumatra. (Today the hole forms a huge lake.) The explosion launched nearly 740 trillion gallons of lava, rock, ash, and debris out of the earth. Ash from the eruption spread more than a million square miles. Scientists have found a layer of Toba's ash nearly a foot thick on the bottom of the Indian Ocean, 1,500 miles away from the volcano.

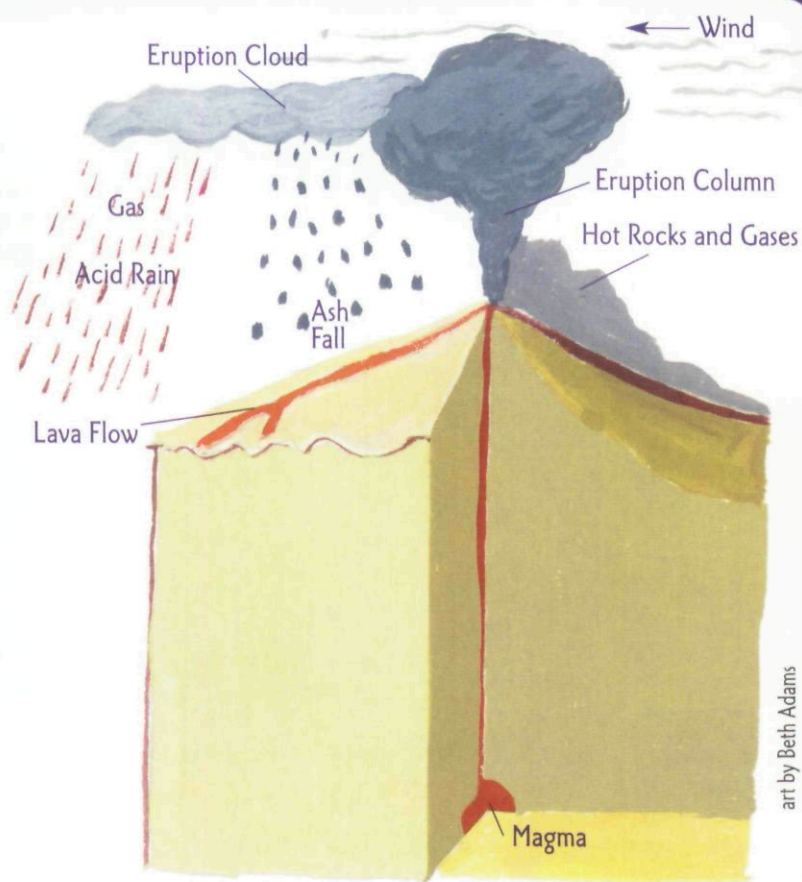
The humongous explosion at Toba caused humongous worldwide problems. Up, up, up rose the volcanic plume—rising higher than 20 miles, where stratospheric currents blew the sulfur dioxide aerosols around, covering the earth in a blanket of

haze that blocked the sunlight. This “volcanic winter” cooled the world’s temperatures by about ten degrees Fahrenheit and changed the world’s climate for the next 1,000 years. In the cooler weather, less water evaporated into



This strange, dark world is actually a Filipino village where ash fell like snow when Mount Pinatubo erupted just 15 miles away.





art by Beth Adams

Volcanoes form when magma, melted rock inside the earth, collects and rises under pressure. The more gas that escapes during the process, the bigger the volcanic explosion.

prehistoric humans, reducing the world's population to around 10,000.

Frankenstein Summer

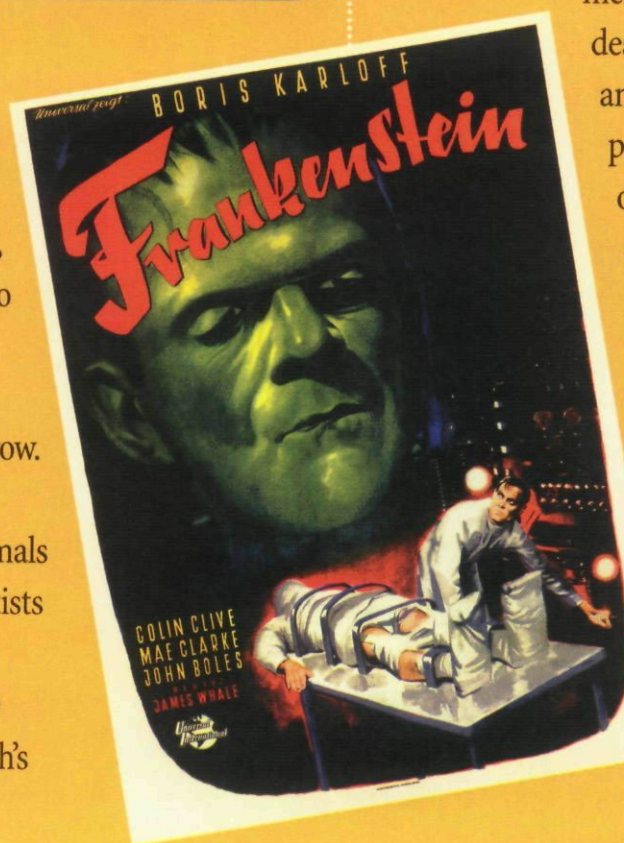
Of course, no one was around to study or record the Toba eruption. By 1815, however, more than a billion people lived on earth. That year, for a week in early April, the largest eruption in modern memory roared out of another Indonesian volcano, called Tambora.

Tambora's firestorm of ash, gas, and rock killed many thousands of people on the surrounding islands. It destroyed all the plants for miles around, poisoned the rice fields, and wiped out livestock. Aerosols from the eruption plume blocked the sun around the world, making 1816 the "year without a summer."

Crops were destroyed in America and Europe, and hungry people ate bread made of sawdust. Strange snow, colored brown, yellow, or red by volcanic dust, fell on parts of Europe.

A group of famous British writers suffered

Dismal weather following the Tambora eruption in 1815 inspired one of the world's greatest horror stories.



The flowers all died . . . sigh.



I'm glad I wasn't around when Toba exploded.



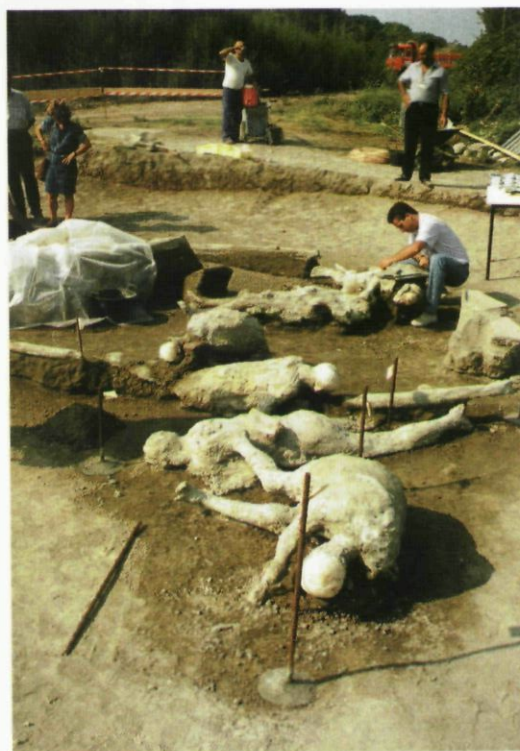
the air, so rainfall became scarce. Drought parched the land, and dirt turned to sand. Without enough sunlight, plants couldn't grow. Without enough plants to eat, animals died. Some scientists believe that Toba nearly caused the extinction of earth's

A Blast from the Past

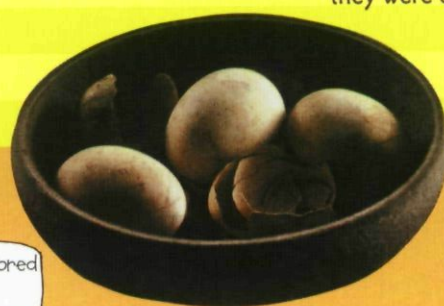
One famous volcano continues to rock the world nearly 2,000 years after its eruption.

August 24, AD 79, began as any ordinary day. The people of Pompeii, a large city located near ancient Rome, went about their daily business. Suddenly, a deafening explosion blew the top off nearby Mount Vesuvius. Tons of ash shot into the air and fell on the city. People ran frantically, but the ash smothered and killed hundreds, burying

them where they fell. In the end, at least 16 feet of volcanic debris completely covered Pompeii and its people. Over the years, water turned the volcanic ash to clay and molded it around each body. Slowly, flesh and bone decomposed, leaving body-shaped impressions in the clay. From these, archaeologists made plaster casts of the bodies. Today, these ghostly figures give us a glimpse of the last terrifying hours of Pompeii.



Plaster casts show where people fell when they were overcome by Vesuvius.



Ash from Vesuvius preserved even this bowl of eggs.

through the wet, cold summer of 1816 on vacation in Switzerland. Confined indoors during the weird weather, they wrote ghost stories to pass the time. The best tale came from the pen of Mary Shelley. She called her story *Frankenstein*.

On the Lookout

Could a supersize volcano erupt any time soon? Maybe, but scientists believe that the larger the volcano, the longer the time between eruptions. Volcanoes as

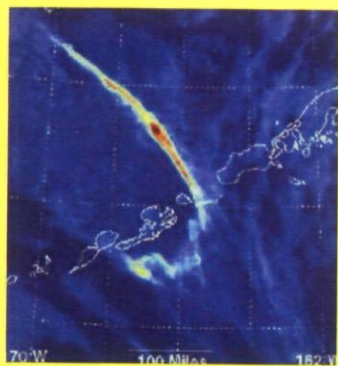
humongous as Toba are rare—they erupt only once in 500,000 years.

Scientists know how important it is to study a volcano's past history to help predict its future activity. By tracking the effects of historic volcanoes, scientists are learning how to predict the way volcanic gases move around the atmosphere, as well as which kinds of eruptions are most likely to produce worldwide problems.

Now the challenge is to learn how to predict eruptions themselves. Scientists constantly monitor active and dormant



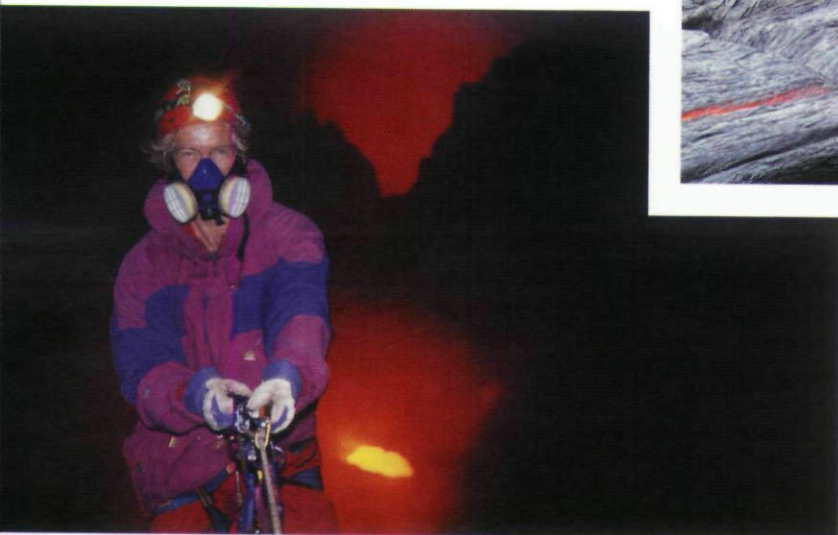
"Tiny" is a good size for a volcano.



From high up in space, satellites can identify volcanoes and track their plumes. This infrared photo (left) charts the path and temperature of ash and gas escaping from a volcano in the north Pacific.



Protected by a heat-proof suit, the volcanologist above records the temperature and content of the lava. The guy on the left is lowering himself into a volcano. Do not try this at home.



(resting) volcanoes. While satellites watch from space for "hot spots" that reveal volcanic activity inside the earth, brave volcanologists get up close and personal with smoldering volcanoes at monitoring stations around the world. They scramble up mountainsides to install devices that measure earth tremors, which usually occur when molten rock and gases inside the earth begin to rise and rumble. They peer into craters to analyze emerging gases for any increases in sulfur dioxide. They get dangerously close to watch the ground

around volcanoes, which can change shape before and during an eruption.

Some volcanic mountains even tilt before they erupt, and observers use "tiltmeters" to track such movement. With 169 volcanoes in the United States, volcanologists are working to beef up the nation's five monitoring stations and to set up a round-the-clock Volcano Watch Office and early warning system.

All this preparation won't prevent eruptions, but it may help us better cope with their worldwide impact on climate and life. Ben Franklin would be impressed.



Don't look now, but that volcano is tilting right at us.

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